

METAL CASTING

Project Fact Sheet



IMPROVED MAGNESIUM MOLDING PROCESS (THIXOMOLDING)

INNOVATIVE MOLDING PROCESS IMPROVES DIE CASTING, SUBSTANTIALLY REDUCING ENERGY, WASTE, AND OPERATING COSTS FOR AUTOMOTIVE AND OTHER INDUSTRIES

Benefits

- Offers potential annual savings of 855 million Btu of natural gas per 150 ton/year installation
- Offers potential annual savings of 320 billion Btu by 2010
- Saves 50% more energy than die casting
- Reduces scrap to be recycled by 50%
- Reduces operating costs by 20%
- Eliminates slag and dross and their disposal problems
- Significantly reduces pollutant emissions, and eliminates the use of sulfur hexafluoride

Applications

The automotive, electronics/communications, and hand tool industries could benefit from this new technology.

Project Partners

NICE³ Program
Washington, DC

State of Michigan Energy Division
Lansing, MI

Thixomat, Inc.
Ann Arbor, MI

Advanced Forming Technologies
Longmont, CO

Alpha Mold, LLC
Huber Heights, OH

Black & Decker Co.
Baltimore, MD

Glycon Corporation
Tecumseh, MI

Phillips Magnesium
Menomonie, WI

Tocco, Inc.
Boag, AL

Visteon Corporation
Dearborn, MI

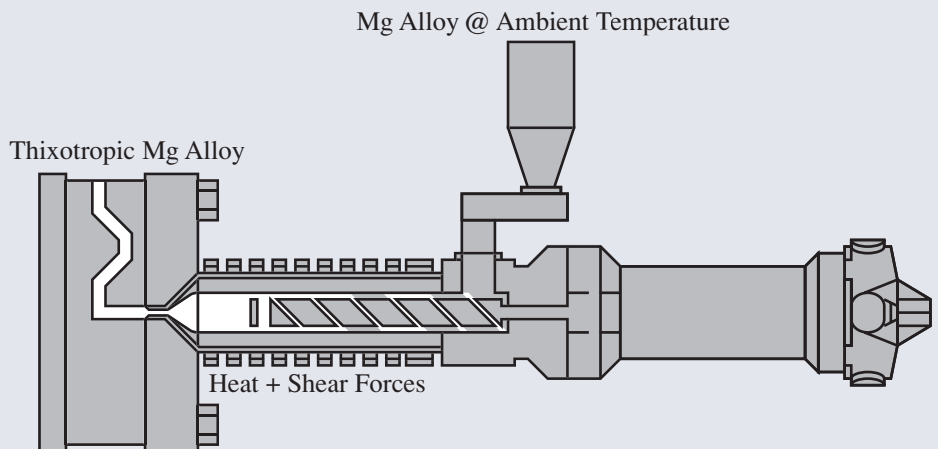
Traditionally, die-cast molding results in product yields of 50% but also creates waste – scrap, slag and dross. The Thixomolding process improves product yields to 90% and eliminates waste and loss of product from melting. The process is worker and environmentally friendly and can be integrated into automated manufacturing to produce metal and metal/plastic assemblies. Compared with die casting, Thixomolding is expected to reduce energy usage and scrap recycling by 50%, reduce overall operating costs by 20%, and eliminate the use of sulfur hexafluoride.

Project Description

Goal: Demonstrate the advantages of Thixomolding technology by improving product yields from the current 50% to 90% while eliminating waste slag and dross, use of greenhouse gases, fire risk, and the loss of product from melting.

Thixomolding technology incorporates preheating of pellets in a feed hopper; deep-penetrating, low-frequency induction heating; a screw feed designed to increase throughput; an improved, tight, non-return valve to maintain the inert argon atmosphere; and the use of “hot runner” technology that improves

THE THIXOMOLDING PROCESS



The Thixomolding system, being developed by Thixomat, Inc., uses “hot runner” and other heating methods to dramatically improve product quality, as well as energy and operating efficiency for the magnesium casting industry.



the yield of parts by 90% or better. All of these methods have been demonstrated separately or as part of a process in a related industry. As with plastic injection, magnesium alloy feedstock pellets are fed in through a hopper. Unlike conventional means, the pellets are preheated before advancing to a reciprocating screw injection machine with a holding barrel and a specially designed screw. Pellet preheating increases the efficiency of heat transfer and increases system throughput.

Thixomat, Inc., is demonstrating the new technology with the assistance of the State of Michigan Energy Division, Visteon Corporation, Alpha Mold LLC, Glycon Corporation, Black and Decker Co., Phillips Magnesium, Advanced Forming Technologies, and Tocco, Inc., with funding from the NICE³ Program in the U.S. Department of Energy's Office of Industrial Technologies.

Progress and Milestones

- Install induction heating system, insulation, and controls; fabricate pellet heating system; and demonstrate induction heating system.
- Demonstrate industrial-scale pellet heating system and non-return valve.
- Manufacture, install, and demonstrate an improved new screw.
- Install induction heater and non-return valve and screw and run the system.
- Install tooling and hot-runner system.
- Demonstrate industrial scale fully equipped unit.
- Write final report.
- Conduct commercialization activities.

Economics and Commercial Potential

These technology improvements to the magnesium alloy molding technology, compared with the current die casting method, could reduce energy usage and scrap recycling by 50% and operating costs by 20%. The yield of parts could improve from the current 50% to 90% or better. Future application to aluminum and/or zinc parts could triple the expected market for Thixomolding technology. Based on one Thixomolding unit processing 150 tons of magnesium alloy per year and a market demand growth rate of 6.5% annually, the current 800 unit market in the United States could grow to an estimated 1359 units, or 96% penetration of an estimated 50% overall market share, by 2020.

This technology could annually save 855 million Btu of natural gas per 150-ton unit. First sales of the technology are expected by 2004. Based on a 50% market penetration by 2010, annual savings could be 320 billion Btu from 375 units installed. Market penetration of 96% by 2020 could save 1.16 trillion Btu from 1359 units. Reduced fuel consumption resulting from this application could translate directly into reduced emissions of 608,000 tons of carbon dioxide annually by 2010, and concomitant reductions in emissions of nitrogen and sulfur oxides and eliminate the use of sulfur hexafluoride.



NICE³ – National Industrial Competitiveness through Energy, Environment, and Economics:
An innovative, cost-sharing program to promote energy efficiency, clean production, and economic competitiveness in industry. This grant program provides funding to state and industry partnerships for projects that demonstrate advances in energy efficiency and clean production technologies. Awardees receive a one-time grant of up to \$525,000. Grants fund up to 50% of total project cost for up to 3 years.

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